

# EPIDEMIOLOGICAL FEATURES OF EPILEPSY IN THE PEDIATRIC POPULATION IN ROMANIA

CATRINEL ILIESCU<sup>1</sup>, CARMEN BURLOIU<sup>2</sup>, DANA GALIETA MINCĂ<sup>3</sup>

<sup>1,2</sup>“Prof. Dr. Alexandru Obregia” Clinical Hospital București, <sup>3</sup>“Carol Davila” University of Medicine and Pharmacy București, National Institute of Public Health București

**Keywords:** epilepsy, child and adolescent, epidemiology, methodology

**Abstract:** Epidemiological studies on epilepsy should provide information regarding its frequency, risk factors, etiologies, associated disorders, outcome and costs. One country can or cannot perform such studies, depending on funding, among other factors. The aim of our paper is to review the various epidemiological approaches and to discuss the associated problems: epilepsy diagnosis, data collection in epidemiological studies, term definitions and the results of a mathematical modelling compared to the current reports available for Romania.

**Cuvinte cheie:** epilepsie, copii și adolescenți, epidemiologie, metodologie

**Rezumat:** Studiile epidemiologice ale epilepsiei trebuie să furnizeze informații cu privire la frecvența, factorii de risc, cauze, afecțiuni asociate, prognostic și costuri implicate. O țară poate realiza astfel de studii, sau nu, în funcție de finanțare, printre alți factori. Scopul lucrării este de a analiza diversele abordări epidemiologice și discuta problemele asociate: diagnosticul epilepsiei, colectarea datelor în studii epidemiologice și definițiile termenilor și de a prezenta rezultatele unei modelări matematice, comparativ cu raportările curente disponibile pentru România.

## INTRODUCTION

Epilepsy is a chronic neurological disorder characterized by a predisposition for recurrent seizures, with varying clinical expressions and etiologies. Worldwide, there are around 40 million people with epilepsy, as reported by Global Burden of Disease (GBD) study, led by World Health Organization (WHO), World Bank and School of Public Health Harvard (1), quoted by Linehan and Berg.(2)

It is estimated that the number of children under 15 who have active epilepsy is around 10,5 million, 25% of all the people with epilepsy.(3)

Epidemiology is the branch of medicine that studies the frequency, distribution and the diseases associated factors in a population. The size of the problem can be determined, as well as the population at highest risk and define the risk factors, associations and causes.(4)

Optimal therapeutic approach can be proposed and the effectiveness of treatment can be evaluated.

Useful information to prevent the disease or its complications and evaluation of social and personal costs can be also provided.

## PURPOSE

The aim of this paper is to review the various epidemiological approaches in epilepsy research, with their advantages and limitations, and to discuss the epilepsy frequency in Romania.

The objectives: - description of associated problems: epilepsy diagnosis, data collection in epidemiological studies and term definitions; - mathematical modelling compared to current reports.

## METHODS

Aspects of methodological approaches and limitations of epidemiological studies of epilepsy

### 1. Issues related to epilepsy diagnosis

Epidemiological studies provide useful information to current medical practice only if using accurate and correct diagnostic data. Epilepsy is not a single disease. Its etiology can be different, with various symptoms, such as the response to treatment and evolution.

The diagnosis of epilepsy is mainly clinical and is supported with information from detailed history of events, careful neurological examination, supplemented with correctly interpreted electroencephalography and modern neuroimaging and genetic data. This is why, ideally, epilepsy diagnosis should be made by physicians specialized in epileptology.(5)

Studies which have estimated diagnostic errors suggest that it is possible that 4,6% - 30% of people diagnosed with epilepsy do not have a correct diagnosis, especially when the diagnosis is supported by nonspecialists.(6)

### 2. Issues related to the collecting data methodology (in population studies)

The methodology of data collecting and data sources were reviewed recently by Linehan and Berg (2) and Thurman et al.(4)

We shall present them synthetically:

- Collecting the data from the medical records of hospitals - possible errors related to the application of different diagnostic criteria by practitioners.
- Collecting the data from the medical records of general practitioners – as mentioned before, possible errors related to diagnosis.

<sup>1</sup>Corresponding author: Catrinel Iliescu, B-dul Berceni, Nr. 2-4, Sector 4, București, România, E-mail: iliescu\_catrinel@yahoo.com, Tel: +40729 66125

Article received on 03.05.2013 and accepted for publication on 05.07.2013  
ACTA MEDICA TRANSILVANICA September 2013;2(3):206-209

- Collecting the data through screening questionnaires - frequently used in epidemiological studies. In the first phase a questionnaire is used, to identify positive cases. In the second phase the positive cases are clinically evaluated to confirm the presence of epilepsy; this way of identifying patients was supported by WHO.(7) There are restrictions in application of this method in certain areas of the world.
- Collecting the data by studying the databases containing antiepileptic drugs (AED's) prescriptions - these studies analyze by definition the AED's treated epilepsy. Errors can appear as AED's are also used in other pathologies: psychiatric, pain, migraine, and even obesity.
- Studies relying on self-reporting - frequently used methodology in North American research. Specific questions for epilepsy are used in population studies of health surveillance. A recently published analysis of the pediatric epilepsy in the USA population covered more than 90.000 parents of children between 0-17 years old.(8) Advantages: - the frequency of self-reported epilepsy in large population groups can be studied, also its impact on the quality of life related to health status (level of education, employment status, comorbidities). There are sources of error: - people who agree to be included in the study may differ from those who refuse it; - the cases cannot be clinically validated - the ones self-reporting as having epilepsy cannot be confirmed, and those who have epilepsy but are not reported cannot be identified.
- Collecting the data by accessing multiple sources - considered by some researchers as the most accurate method for case identification.(9)

Studies that analyze data-linkage provide the opportunity to study population data along with the data from the hospital registers;(10,11,12) here comes the problem of personnel, funding and complexity level of health services.

**3. Problems of term definitions**

Lack of harmonized definitions across studies leads to heterogeneous results. Although ILAE established the term definitions (4,13,14), studies use different interpretations of these.(2)

**Analysis of the results of epilepsy epidemiological studies**

A systematic research conducted by Forsgren et al.(9), published in the *European Journal of Neurology*, showed that no epidemiological study conducted in Europe provided data from more countries. There is no research that has studied an entire country. Combining information from population studies from several European countries can provide an illustrative picture of epilepsy epidemiology in Europe.

Forsgren et al. emphasized that in principle, it is not compulsory the conduct of epidemiological studies in all European countries "as results from individual countries largely can be generalized to neighbouring countries with similar life conditions".

These data could be used for an estimate of the number of people with this condition in a particular country. The authors (9) analyzed and compared the results of epidemiological studies of epilepsy incidence and prevalence from Europe, making estimates of active epilepsy incidence and prevalence in the general population and in different age groups (children and adolescents, active adults and seniors respectively) (table no. 1).

**Table no 1. Estimates of the incidence and prevalence of epilepsies in different age groups, as analyzed by Forsgren et al.**

Type of registration	Estimates used
Epilepsy incidence for all age groups	50-55 per 100.000 population (for calculation: 52.5)
Epilepsy incidence in children and adolescents (0-19 years)	70 per 100.000 inhabitants
Epilepsy incidence in active adults (20 - 64 years)	30 per 100.000 inhabitants
Epilepsy incidence in seniors (at least 65 years)	100 per 100.000 inhabitants
Active epilepsy prevalence in the general population	6 per 1000 inhabitants
Active epilepsy prevalence in children and adolescents (0-19 years)	4.5 – 5 per 1000 inhabitants (for calculation: 4.75)
Active epilepsy prevalence in active adults (20-64 years)	6 per 1000 inhabitants
Active epilepsy prevalence in seniors (at least 65 years)	7 per 1000 inhabitants

*Data source: estimates by Forsgren et al analysis (9)*

**Epilepsy epidemiology in Romania – current estimative data obtained with a mathematical model**

Due to the limitations that an incidence study may have, we believe that the model for an estimative calculation of epilepsy incidence is logical and reasonable in order to be applied to Romania – it is probable that our population is not different from other European nations, from a genetic point of view, as well as the environmental factors that might impact the epilepsy frequency in the population. It is also possible that we will be criticized for this. A prospective incidence study would be best, but not realistic considering the current funding and organizational states of the medical system, in which it is unlikely that one could correctly study the incidence in a representative area for the whole country and also because of the inhomogeneous addressability of patients to the specialists in present time.

We used data from The National Institute of Statistics, The Annual Statistics Publication (ASP) 2008 (15), which contains detailed information about the Romanian population on 1<sup>st</sup> of July 2007. We analyzed the year 2007 because it is the middle year between two national censuses (2002, 2011). Parts of the results of this statistical model have been previously published, as preliminary research data, by the first author.(16) Based on the data from ASP – 2008, we calculated the number of people from different age groups, according to WHO: children and adolescents (<20 years), active population (20-64 years) and seniors (from 65 years on). We calculated the figures for 0-17 years (<18 years) age group because the pediatric neurology clinics and pediatric hospitals in Romania admit patients until 18 years.

We applied the estimative data from the theoretical model proposed by Forsgren et al. for the general Romanian population on 1<sup>st</sup> of July 2007, and according to age groups, and the results are presented in table 2.

For incidence - using both calculation methods, the result was 10.650-11.310 (average approximately 11.000) new epilepsy cases in Romania in 2007.

For prevalence – the result was 126.400-129.000 (average value 128.000) people with active epilepsy in Romania in 2007.

## PUBLIC HEALTH AND MANAGEMENT

**Table no 2. Estimated epilepsy incidence and prevalence in Romania, according to available statistical data for 2007**

	General population of Romania on July 1 <sup>st</sup> 2007		Children and adolescents (0-19 years) – 1		Active population (20-64 years) – 2		Seniors – 3		1+2+3
Total		21,54 million		4,83 million 22.43%		13,5 million 62.71%		3,2 million 14.86%	21,54 million
Incidence per 100,000 people per year / number of persons per year	50-55 (calculated 52.5)	11.310 new cases per year	70	3.400 new cases per year Approx. 32%	30	4.050 new cases per year 38%	100	3.200 new cases per year 30%	10.650 new cases per year 100%
Prevalence of active epilepsy per 1000 persons / number of people	6‰	Approx. 129.000 patients with active epilepsy	4.5-5‰	23.000 patients Approx. 18.2%	6‰	81.000 patients 64.1%	7‰	22.400 patients 17.7%	126.400 patients 100%

Data from: Calculation model based on extrapolating the data from recent European studies summarized by Forsgren et al., 2005, and from NSI on July 1<sup>st</sup> 2007

Data obtained from the National Centre of Statistics and Informatics in Public Health

The results for the 0-17 years old age group are presented in table no. 3.

**Table no. 3. Estimate epilepsy incidence and prevalence in Romania, for the 0-17 years old age group, according to available statistical data for 2007**

	Values used for calculation	Age group 0-17 years
Total number of persons, divided by age groups	NSI data	4.14 million
Epilepsy incidence	70 new cases per 100.000 children annually	2.900 new cases per year
Active epilepsy prevalence	4,5-5‰	20.000 persons

Data from: Calculation model based on extrapolating the data from recent European studies and from the National Statistics Institute, on July 1<sup>st</sup> 2007.

### Epilepsy epidemiology in Romania - available data

The Romanian Ministry of Health makes an annual report for chronic diseases, based on data obtained from family doctors, by December 31<sup>st</sup> of each year. The records contain the total number and of different age groups: < 1 year old, 1-4 years old, 5-14 years old, 15-24 years old, 25-64 year old, from 65 years old on. The numbers for 2005-2009 are shown in table no. 4. For the year 2007, there were 11.327 new epilepsy cases reported, and 93.211 persons with epilepsy were still in the care of family doctors.

**Table no 4. Newly diagnosed epilepsy cases and active epilepsy cases in the care of family doctors, by December 31<sup>st</sup>. Data reported to the Ministry of Health by the family doctors, during 2005-2009**

Year	No. of new epilepsy cases	No. of active epilepsy cases still in care
2005	11.844	85.683
2006	11.396	89.862
2007	11.327	93.211
2008	11.018	95.548
2009	11.502	98.826

## DISCUSSIONS

The present paper reviews the enlistment methods of epilepsy cases in epidemiological studies, with their advantages and limitations, and compares the data obtained by a mathematical modulation for Romania with data offered by the Ministry of Health. It can be noted that at least in Romania, there is a lack of unifying the data. The age groups reported by hospitals in Romania are of little relevance from our point of view. In Romania, the population younger than 18 years of age (0-17 years) is in the care of pediatric neurologists and pediatricians, so it could be useful to be reflected in the Ministry of Health reports. On the other hand, neither WHO's nor the statistic institutes' age groups overlap with the pediatric departments in Romania or abroad, and maybe this should also be consolidated at a certain point in the future.

By comparing the data from the Ministry of Health with the one from the mathematical analysis, we noticed some promising aspects regarding newly diagnosed epilepsy cases – the total number reported is close to the one generated by our analysis. When it comes to already known epilepsy cases, we found important differences. This shows, amongst other things, that collaboration between specialists and primary care should be improved, in order to have correct final reports, important to be analyzed by the Ministry of Health.

## CONCLUSIONS

Epilepsy is an important disease in pediatric neurology, due not only to its frequency, but also to the impact it may have on the affected person. The correct approach always starts with a correct diagnosis, best if done by an epileptology specialist. Knowing the problem also implies estimating, in a direct manner or indirectly, the frequency of the cases in the general population, which allows calculating the number of specialists in the field, diagnostic centres and costs, both the country's and personal, for managing these cases.

For this reason, it is important to mention that the mathematical model we applied for the Romanian population at July 1<sup>st</sup> 2007 led to the following estimates: there were possibly around 11.000 newly diagnosed epilepsy annually, of which 2.900 were persons under 18 years old, and there were possibly 128.000 persons with active epilepsy, of which 20.000 were

under 18 years old. One must compare these values with the data from the Romanian Ministry of Health, which, based on reports from family doctors, announced a number of 11.327 newly diagnosed epilepsy cases and 93.211 known epilepsy cases in 2007.

We believe that this approach allows analysis of numbers and both diagnostic and reporting methods and could contribute to improving the accuracy of the data available at the Ministry of Health, respectively a correct management of resources and a better health care for epilepsy patients in Romania.

### REFERENCES

1. World Health Organization. The global burden of disease: 2004 update, Geneva, World Health Organization; 2008.
2. Linehan C, Berg AT. Epidemiologic aspects of epilepsy. In Wyllie E, Cascino GD, Gidal BE, Goodkin HP, editors. *Wyllie's Treatment of Epilepsy. Principles and Practice*, 5th ed. Lippincott Williams & Wilkins, a Wolters Kluwer business; 2011. p. 2-10.
3. Forsgren L. Incidence and prevalence. In: Wallace SJ, Farrell K, editors. *Epilepsy in children*, 2nd ed. London: Arnold; 2004. p 21-25.
4. Thurman DJ, Beghi E, Begley CE, Berg AT, Buchhalter JR, Ding D, et al. Standards for epidemiologic studies and surveillance of epilepsy. *Epilepsia*. 2011;52 Suppl 7:2-26.
5. NICE. The epilepsies: the diagnosis and management of the epilepsies in adults and children in primary and secondary care. Clinical guideline CG137. Issued: January 2012. Available at: <http://www.nice.org.uk>.
6. Chowdhury FA, Nashef L, Elwes RDC. Misdiagnosis in epilepsy: a review and recognition of diagnostic uncertainty. *Eur J Neurol*. 2008;15:1034-1042.
7. World Health Organization. *Research Protocol for Measuring the Prevalence of Neurological Disorders in Developing Countries*. Geneva: World Health Organization; 1981.
8. Russ SA, Larson K, Halfon N. A national profile of childhood epilepsy and seizure disorder. *Pediatrics*. 2012;Feb;129(2):256-264.
9. Forsgren L, Beghi E, Oun A, Sillanpaa M. The epidemiology of epilepsy in Europe – a systematic review. *Eur J Neurol*. 2005;12:245-253.
10. Svendsen T, Lossius M, Nakken KO. Age specific prevalence of epilepsy in Oppland County, Norway. *Acta Neurol Scand*. 2007;116:307-311.
11. Morgan CL, Kerr MP. Epilepsy and Mortality: a record linkage study in a UK population. *Epilepsia*. 2002;43:1251-1255.
12. Koepsell TD, Weiss NS. *Epidemiologic Methods: Studying the Occurrence of Illness*. New York: Oxford University Press. 2003.
13. Commission on Epidemiology and Prognosis of the International League Against Epilepsy. Guidelines for epidemiologic studies in epilepsy. *Epilepsia*. 1993;34(4):592-596.
14. Fisher RS, van Emde Boas W, Blume W, Elger C, Genton P, Lee P, et al. Epileptic Seizures and Epilepsy: Definitions Proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). *Epilepsia*. 2005;46(4):470-472.
15. Anuarul Statistic al României 2008. Available at [www.insse.ro](http://www.insse.ro)
16. Iiescu C. Date actuale ale incidenței și prevalenței epilepsiilor la copil și adolescent. *Revista SNPCAR*. 2011;14(1):59-78.